Travel Behavior of Hispanic Immigrants of Southern California – Impact Analysis of Future Growth based on Parcel-Based Sketch Planning Model

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Submitted to the 4th Conference on Innovations in Travel Modeling (ITM)

1. INTRODUCTION AND OBJECTIVE

Many studies have recognized that daily travel choices are related to choices of residential location, housing type, job location, auto ownership, and commuting mode. When people decide where to live, at the same time they also consider how to travel in order to access daily activities. Since travel behavior can be very different by demographic groups, analysis on land use – travel behavior relationship can be misleading if not considering the demographic composition. Past research has shown that race and ethnicity is an important demographic factor that has significant influences on travel behavior. The objective of this research is to analyze and estimate the impact of future growth of Hispanic immigrants on the transportation system in Southern California. A parcel-based statistical model system was developed to perform this analysis.

Southern California is known for its diversified demographics. According to the 2010 American Community Survey (ACS), 31% of the total residents in Southern California was born in foreign countries, and nearly 60% of them are of Hispanic origin. The share of foreign born population in Southern California is the highest among 125 statistical areas in the nation and two and a half times higher than that of the nation. The Southern California region rapidly moves toward a majority of Hispanic population. According to the recent growth forecast by the Southern California Association of Governments (SCAG), the region's Hispanic population is expected to grow from 45% in 2010 to 56% in 2035, while the non-Hispanic White population sharply drops from 34% in 2010 to 22% in 2035.

Assimilation trend of the immigrants has been widely discussed. Myers and Pitkin (2010) confirm the overall assimilation trend of the immigrants in the areas of citizenship, home ownership, English language proficiency, job status, and earning a better income. They summarize their study by stating that " the longer immigrants are in the U.S., the more integrated they become, a fact that remains consistent across the nation, regardless of whether they came from Mexico and Central America or from other countries". The findings of immigrant studies indicate that there is generally an assimilation pattern of immigrants with different phases. Past studies of immigrant assimilation include, but not limited to: socioeconomic status (Kasinitz et al,

2004), Intermarriage (Perlmann and Waters, 2004), urban labor market (Borjas, 2004), urban housing market (Myers and Liu, 2005), household formation (Choi, 2008), and residential patterns (Zhou and Myers, 2007).

Transportation assimilation of immigrants is also observed. There have been efforts to understand the changing travel behavior of immigrants on transit use (Blumenberg and Evans, 2010). The findings generally support the immigrants' assimilation in the use of transit. Generally, Hispanic immigrants use more transit services than general public, but U.S. born or settled immigrants use more vehicles for access to their daily activities.

In large combined statistical areas such as Los Angeles, San Francisco, and New York, immigrants already account for around 30% of the total population of the region. Since the immigrants' assimilation in travel behavior is observed, and the assimilation is related to the future immigration trends of a region, a travel model that can reflect different growth patterns by Hispanic immigrants will be helpful in understanding the implications on transportation and the related greenhouse gas (GHG) emissions.

Our analysis based on the 2009 National Household Travel Survey (NHTS) found that, as Hispanic immigrants stay longer in the US, their income status is improved, and they tend to live in a single-family house of a lower-density neighborhood, similar to the U.S. born population. Their travel behavior follows a similar pattern: the settled immigrants tend to commute longer distances, use cars more frequently, and use less transit than newer immigrants do.

The key question in this study is, if future growth of immigrants slows down or increases dramatically due to policies changes or other reasons in Southern California, what might be the impact to overall transportation demand on both roadway systems and transit services? We propose to develop a household travel model to assess the impact on travel pattern for SCAG region based on different growth patterns of Hispanic immigrants.

2. METHODOLOGY

The approaches of this research are 1) to develop a sketch planning model that can analyze the impact of Hispanic households on daily travel, and 2) to use the model to assess the impacts of different level of growth by Hispanic immigrants on travel pattern for SCAG region.

2.1 Model Development

A sketch planning model is developed to quantify the influence in travel patterns by future growth change of Hispanic immigrants. Travel behaviors will be compared among recent Hispanic immigrants, long-settled Hispanic immigrants, and the U.S. born Hispanic population. Through this analysis, we expect to find the overall change in travel behavior among Hispanic immigrants. Following the typical assimilation theory, we hypothesize that, if Hispanic immigrants stay longer in the US, then their income status is improved along with English language proficiency, and they tend to live in a single-family house within a low-density neighborhood of a suburban city, similar to the U.S. born. In summary, the long-settled Hispanic immigrants will drive more often, travel longer distances, and use less transit than recent Hispanic immigrants.

The model, estimated by statistical modeling using the 2009 National Household Travel Survey (NHTS), can analyze the impact of demographic characteristics as well as land use factors on household travel characteristics. The 2009 NHTS data for SCAG region contains approximately 6,700 households, 15,000 persons, and 55,000 trips. This model includes five sub-models: 1) vehicle ownership model, 2) vehicle trip model, 3) mode share model, 4) daily trip model, and 5) household VMT model. Figure 1 shows the relationship of the five models and their output.

Based on the number of years a Hispanic householder has been in the U.S, six household categories are created: 1) a householder has been in the U.S. less than 10 years, 2) 10-19 years, 3) 20-29 years, 4) 30 year or longer, 5) the householder is U.S. born, and 6) a non-Hispanic householder. A dummy variable that is created for each Hispanic category is used as an independent variable. The non-Hispanic households are used as the base group.

Except for the dummy variables for Hispanic households, other key independent variables used in model development include household size, number of workers, household income, household vehicles, and neighborhood land use such as household density, employment density, street connectivity, mixed use, regional accessibility. If time is permitted, we will further analyze how land use-transportation relationship by different Hispanic categories.

2.2 Scenario Test

After the model is developed and tested, we will conduct scenario tests in terms of immigration policy, including a base year scenario that reflect current situation (2008), and three 2035 future scenarios that include a base case scenario, a restricted scenario, and a open scenario. It is expected that a more restricted immigration policy will result in relative high demand on vehicle use and less demand on transit services due to higher proportion of long-settled immigrants who are more assimilated to the life style of the U.S. born. An open policy will need to consider sufficient demand on transit services. Though those scenarios are simple assumptions, given a diversified geographic distribution of Hispanic population as well as dynamic interaction between land use pattern and travel behavior in Southern California, this statistical model can be a supplement tool to regional travel demand model.

Since this model is designed for using disaggregated data as model input, we developed a parcel-level socioeconomic database that is well controlled by the SCAG TAZ data. The parcel database includes the number of households and the number of employment for each parcel. Each household is allocated with the number of household members by their working status and age, and median household income. A ¼ mile buffer of each parcel is created to calculate household density and employment. For those data that currently cannot be created at the parcel level, TAZ data is used. Accessibility is calculated based on the output data of SCAG's trip-based model.

It is expected that the analysis of this research, when controlling for socioeconomic characteristics and residential land use factors, is able to find out the relationship between travel characteristics and Hispanic immigration status. In addition, because current trip-based model does not consider status of Hispanic origin as one factor, our model result can reflect potential

misrepresentation of future VMT as well as greenhouse gas emission if future immigration policy has drastic change. Since Southern California has high proportion of new immigrants, the change in immigration growth will have potential impact on transportation system of SCAG region.

3. CURRENT FINDINGS

3.1 Results of Model Development

The model results are as expected. The coefficients of variables are shown reasonable sign for each sub-model (results available upon request). The results show that recent Hispanic immigrants (entered U.S. less than 20 years) own fewer cars, and have higher mode share as carpool passengers, transit users, and traveling more on non-motorized modes (primarily walking) than remaining demographic groups. In other words, travel behavior for settled Hispanic immigrants is no significant difference from U.S. born Hispanic as well as non-Hispanic groups.

To test model quality, we apply the estimated equation back to the NHTS data to calculate the predicted value for each sampled household. Table 1 shows that the predicted values calculated by the model are consistent with the observed values from NHTS households.

3.2 Results of Scenario Test

Table 2 shows results of scenario tests. The assumption for 2035 base case scenario is that the share of recent Hispanic immigrants (households) total Hispanic households is 25.96% that is based on year 2008 data. The share increases to 45.96% for the open scenario, and reduces to 5.96% for the restricted scenario. The results show that a more open scenario has lower demand on vehicle use and higher demand on transit and non-motorized modes than a more restricted scenario does. As a result, regional total VMT of each scenario is shown plus/minus 1.6% from base case scenario.

4. CONTRIBUTION AND MODELING PRACTICE

This major contribution of this research is to prove a significant impact of future growth on Hispanic immigrants on vehicle use and travel characteristic, and to quantify the level of the impact. The results have also shown significant policy implication on transit services. Given natural growth of total Hispanic population, transit share is expected to increase by 50 percent.

There is a lack of representation of demographic factors in the regional travel demand modeling process. With the significant share as well as fast growth of immigrants and minority populations in the region, this research shows that this impact on regional transportation is significant. Because of the assimilation of travel behavior of Hispanic immigrants and the second generation, the consideration of the regionally significant subgroups in the region would improve the accuracy of travel demand in the future.

VMT is the most commonly used indicator for evaluating regional transportation plans because it reflects the level of the use of vehicles and has implications on air pollution as well as greenhouse gas emissions. The result of this research shows that total regional VMT can be substantially different due to different immigration policy. This research can enhance the accuracy to estimate future greenhouse gas GHG emissions.

Lastly, this sketch planning model is easy to test many scenarios in short time. It can be a supplemental tool to regional model that will take days to run a scenario.

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Figure 1 Relationship and Output of Five Sub-Models

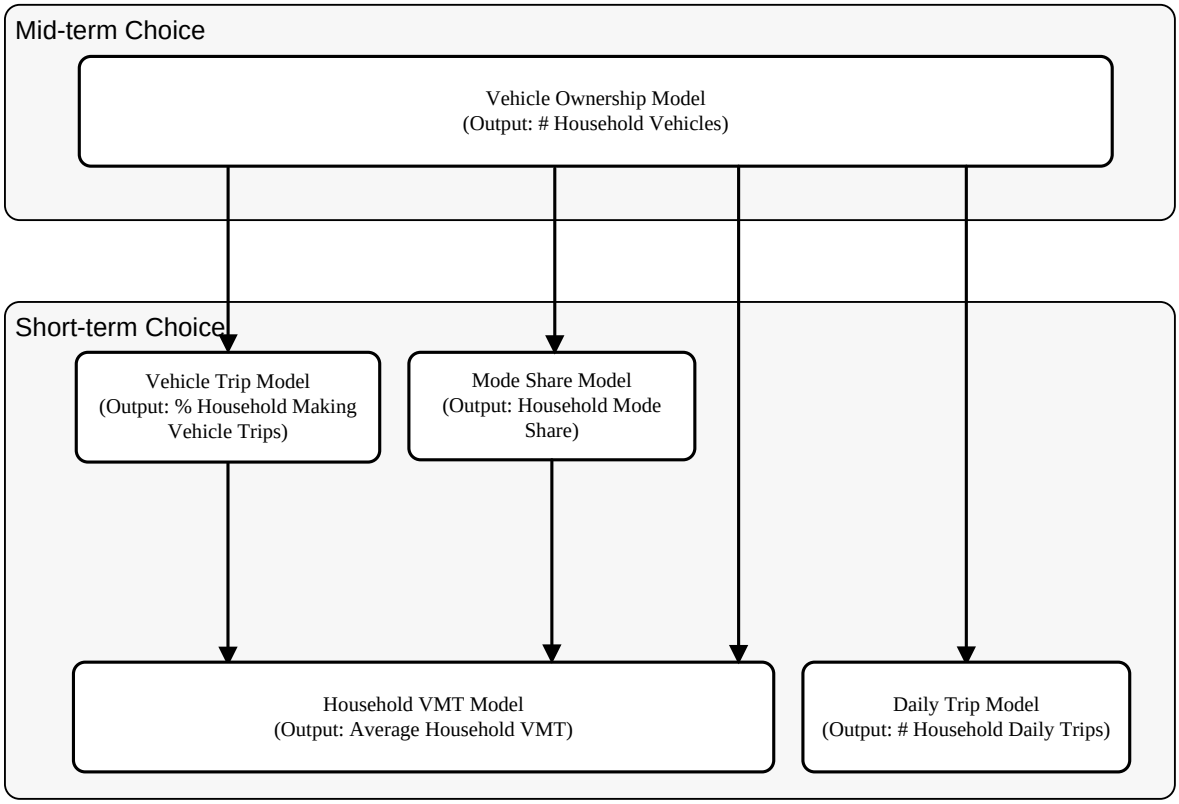

Table 1 Model Validity Tests

Hispanic- Years in U.S.	Observed	Predicted	% Difference
Number of Vehicle per Household			
Hsip Imm. <10 yrs	1.20	1.18	-2%
Hisp Imm. 10-19 yrs	1.40	1.39	-1%
Hisp Imm. 20-29 yrs	1.96	1.86	-5%
Hsip Imm. 30+ yrs	1.85	1.90	3%
Hisp U.S. born	2.10	2.00	-5%
Others Race/Ethnicity	2.04	1.99	-2%
All	2.00	1.96	-2%
Share of Transit Use			
Hsip Imm. <10 yrs	11.5%	12.2%	6%
Hisp Imm. 10-19 yrs	10.2%	10.7%	5%
Hisp Imm. 20-29 yrs	3.5%	3.4%	-2%
Hsip Imm. 30+ yrs	4.0%	4.5%	10%
Hisp U.S. born	1.3%	1.5%	16%
Others Race/Ethnicity	1.1%	1.2%	11%
All	1.8%	1.9%	9%
Share of Using Non-Motorized Modes			
Hsip Imm. <10 yrs	30.3%	29.8%	-2%
Hisp Imm. 10-19 yrs	27.5%	27.1%	-1%
Hisp Imm. 20-29 yrs	21.0%	21.0%	0%
Hsip Imm. 30+ yrs	14.7%	14.9%	2%
Hisp U.S. born	11.6%	11.3%	-3%
Others Race/Ethnicity	11.8%	11.5%	-2%
All	13.0%	12.8%	-2%
Household VMT			
Hsip Imm. <10 yrs	35.1	35.1	0%
Hisp Imm. 10-19 yrs	43.5	46.6	7%
Hisp Imm. 20-29 yrs	55.2	54.9	-1%
Hsip Imm. 30+ yrs	49.8	53.5	7%
Hisp U.S. born	56.3	54.3	-3%
Others Race/Ethnicity	51.2	51.2	0%
All	51.4	51.4	0%

Table 2 Results of Scenario Test

	2008	2035 Base Case Scenario	2035 Open Scenario	2035 Restricted Scenario
Household Vehicle	2.13	2.05	2.02	2.08
% Vehicle Trips	80.02%	78.67%	77.46%	79.86%
Totla Daily Trips	11.99	11.68	11.67	11.68
Auto Driver	58.22%	54.97%	53.55%	56.40%
Auto Passenger	21.09%	20.51%	21.02%	19.99%
Transit	2.42%	3.71%	3.94%	3.49%
Non-Motorized Modes	15.70%	18.44%	19.13%	17.75%
Other	2.58%	2.36%	2.35%	2.37%
VMT per Household	51.35	45.64	44.90	46.37
Regional Households	5,923,973	7,442,735	7,442,735	7,442,735
Regional VMT	303,306,098	338,660,652	333,240,219	344,109,218
% Difference from Base Case			-1.6%	1.6%